	Division of Public Works Department of Highways and Transportation 118 North Market Street Frederick, Maryland 21701	**STANDARD PROCEDURES**
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Description/Purpose

~~Surface conditions on gravel roads are dynamic and change quickly depending on the weather, traffic conditions, and maintenance practices. Maintenance activities must address road serviceability and the needs of the travelling public within the limits of available time and money~~Gravel roads require routine maintenance throughout the year as potholes develop and washouts occur from storms. Proper maintenance improves gravel road durability and ride quality.

The purpose of this ~~policy~~ document is to ~~define~~ describe the basic maintenance techniques, materials, and equipment that Frederick County ~~road users can expect on gravel surfaced County roads, and the frequency and extent of that maintenance. This policy will also establish a protocol for addressing specific complaints and/or maintenance problems that are not adequately addressed through "normal" maintenance operations.~~staff will utilize when maintaining gravel surfaced roads.

Equipment Notes~~Procedures~~

~~Gravel road maintenance is divided into several types, based on frequency and causation. Gravel roads can be expected to require some maintenance on an annual basis, and additional maintenance may be required to address issues caused by inclement weather or other unexpected events~~Grader – Operating speeds shall be limited to prevent hopping which would cause a washboard effect.
Blade – "Stinger" toothed blade shall be used to minimize aggregate segregation when grading
Roller – smooth drum vibratory roller shall be used whenever possible to consolidate newly shaped aggregate.

Aggregate Types

~~A. Annual Maintenance~~

Fine Gravel – also known as "dirty crushed stone", should be used on all steep slopes, which allows the material to bind together and prevents kicking out of stones and washboarding.

No. 8 Crush Run – suitable for use on all gravel roads.

Driving Surface Aggregate – should be use only when resources are available to install per Center for Dirt and Gravel Roads Studies protocol (i.e., place when wet on prepared base with asphalt paver and apply vibratory roller). ~~The typical annual cycle includes the following operations, listed by season. These activities are subject~~

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~~to limitations such as available funding and available resources. Activities marked with an asterisk (*) are typically the first to be reduced or eliminated when funding levels drop.~~

General ~~Annual Maintenance Summary:~~Notes

Signage – All proper work zone signs shall be in place prior to start of road repair.

Drainage – Good drainage is required on all gravel roads. Ditch lines will be cleaned prior to grading.

Potholes - Once ditch lines are clean, potholes will be scarified to a depth below the bottom of the deepest pothole, and the area regraded.

Crown – The road will be reshaped with a well-defined crown, where the centerline is the highest point and each side slopes down to the outer edge of the road. The cross slope will be steeper than that found on a paved road, and should not be rounded.

General Grading Procedures

Spring Grading – To be performed after end of winter weather season.

1. Potholes will be dug out with a stinger or toothed grader blade as described above, and aggregate remixed.
2. Entire road will then be scraped
3. New material will be placed in a windrow in the center of the roadway.
4. The grader will then use the stinger blade to level out the windrow.
5. After the windrow is level, the crown will be established as described above.
6. Whenever possible, the road should be rolled to pack all loose material.

Dust Control - Dust control agent (calcium chloride) should be applied between late April and mid May.

1. Road surface should be scraped with a stinger blade to loosen the material prior to application of calcium chloride. Crown should be established if not present and maintained during preparation work.
2. Calcium chloride applied per manufacturer's instructions.
3. Road should not be rolled after application of calcium chloride.

Intersections - The crown of the major road through an intersection should be maintained.

1. Gradually eliminate the crown of the minor road 50 to 100 feet before the intersection.
2. Pull any aggregate off the paved road.

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3. Perform extra passes as needed to eliminate crown and provide correct shoulder slope.
4. Remove any bumps, dips, or loose material at the edge of the paved road.

Road Reshaping - The purpose of reshaping is to remove surface irregularities, restore surface drainage, and to remix the aggregate to improve surface stability.

1. Install work zone traffic control devices.
2. Check if more aggregate or fines need to be added to the road surface.
3. Tilt the moldboard to a cutting position
4. Angle the moldboard 30 to 4- degrees. Move aggregate to the center of the road.
5. Tilt the front wheels 10 to 15 degrees from vertical in the direction the aggregate rolls across the blade.
6. Put enough pressure on the blade to cut shoulders and washboard ridges. Remove gravel material off of bridges.
7. Scarify the surface when necessary.
8. Check to see if more passes are necessary.
9. Windrow remixed aggregate to the center of the road.
10. Distribute aggregate evenly, blading material to the proper crown.
11. Blade the shoulder downward towards ditch so the slope is greater than the slope of the road.
12. Consolidation of the surface aggregate by smooth drum vibratory roller, instead of traffic, will extend the life of the reshaping job.

Localized Pothole Repair – If the road surface is generally in good condition, localized potholes can be filled by hand to avoid disturbing a larger area.

1. Fill potholes by hand with No. 8 Crusher Run stone.
2. Use hand tamper to consolidate.

Last revised on 7/26/2016~~Season Frequency~~

~~Winter~~

~~Snow Removal As needed~~
~~Application of anti-skid As needed~~
~~Application of deicing product Only under special circumstances, limited extent~~

~~Spring~~

~~Grading, which includes: One, additional grading as needed~~

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~~Pull shoulders As necessary~~
~~Clean pipes As necessary~~
~~Cut out potholes As necessary~~
~~Compact aggregate As necessary~~
~~Add aggregate As necessary~~
~~General inspection, which includes: one per year~~
~~Review of signage~~
~~Pipe inspection~~
~~Guardrail inspection~~
~~*Weed Control at guardrails One application to affected areas~~
~~*Dust Control Once per year as needed if funding is available~~

~~Summer~~
~~*Mowing 2-3 times per year total~~

~~Fall~~
~~Grading, which includes: Once per year~~
~~Pull shoulders As necessary~~
~~Clean pipes As necessary~~
~~Cut out potholes As necessary~~
~~Compact aggregate As necessary~~
~~Add aggregate As necessary~~
~~*Weed Control at guardrails One application to affected areas, if funding is available~~

~~Detailed description of annual maintenance activities:~~

- ~~Snow Removal: Snow removal operations on gravel roads vary according to weather conditions. Standard snow plows attached to dump trucks are damaging to gravel roads and are not typically used. Instead, motor graders and pickup truck mounted plows are used. These plows are positioned at the road surface when the temperature is low and the road surface is frozen solid. When conditions are warmer, the blade is lifted slightly above the road surface and some snow is left behind. This technique minimizes the damaged caused by the plow blade when it comes into contact with the road surface.~~

- ~~Anti-skid: Deicing agents such as sodium and magnesium chloride and sugar based products are not suitable for regular use on gravel roads. The chemicals in these products infiltrate the stone aggregate and attract and retain moisture over long periods of time, weakening the road base. If ice is a problem on a gravel~~

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~~surfaced road, anti-skid or stone chips will be applied as needed to provide additional traction. Note that anti-skid is a stone quarry product and is not related to cinders, which are no longer available. Under extreme circumstances deicing agents may be used, but only in limited areas.~~

- ~~Grading operations: Grading operations are performed to correct surface failures on gravel roads. The motor grader operator uses a straight blade to dig into the road surface, eliminating shallow ruts, potholes, and corrugations, while re-mixing the aggregate. Material that has been pushed to the side and onto the shoulders by passing vehicles is "pulled" back into the road and reincorporated into the road. The road surface is reshaped to form a "crown". A crowned road is higher in the center and each side slopes to the outer edge, draining surface water to the sides of the road. After the road is reshaped, the aggregate may be compacted with a roller. During the grading process other maintenance issues can be identified and addressed, such as blocked pipes and ditches. In some cases other equipment required to achieve positive drainage. For example, hydraulic excavators (Gradall machine) are used to clear ditchlines of debris near headwalls where graders cannot reach. Additional aggregate may be applied as necessary to replace material lost through erosion or snow removal activities, or to address areas with weak subbase that are prone to be soft and wet.~~

- ~~General inspections: Inspections are conducted while other annual maintenance tasks are underway. For example, during spring grading activities, staff will address any necessary sign repairs or replacement. While pipes are being cleared of debris staff will check their condition and schedule them for replacement or repair if they are found to be insufficient.~~

~~Gravel roads typically have few roadside signs due to the lower speeds and volumes encountered compared to asphalt roads. One should not expect the same size, types, or number of signs on a gravel road as one would expect on an asphalt road.~~Traffic Control Devices on Gravel Roads: ~~Traffic control devices, specifically regulatory and warning signs, will be used on gravel roads where appropriate according to the standards established by the Maryland Manual on Uniform Traffic Control Devices (MD MUTCD). Sign size and frequency of use may be reduced to the minimums allowed by the MD MUTCD. Regulatory speed limit signs will not be posted at speeds lower than 25 miles per hour, and will be posted only where necessary. Signs that are not necessary for traffic control or safety will not be used so that the rural and scenic nature of the road is preserved.~~

- ~~Weed control: Herbicidal agents are used only in places that are impossible to mow with a side mounted mowing machine and too inefficient to mow with hand held devices. Typically this activity takes place most often around the base of guardrail posts.~~

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~~• Mowing: Gravel roads are generally mowed according to the same schedule as tar and chip and asphalt roads. Mowing activities are focused on managing roadside vegetation to maintain or improve visibility for road users, and prevent encroachment of vegetation into the travelled way. Vegetation is usually cut further back at intersections to improve sight distance when possible.~~

~~• Dust control: Dust control activities seek to reduce the quantity of airborne dust produced by vehicles on gravel roads. Dust has the potential to create inconveniences for roadside residents and road users, and also contributes to the deterioration of the road itself. Loss of rock fines (dust) leads to loss of larger sized aggregate over time. Studies have shown that as much as one ton of aggregate per mile is lost each year for each vehicle that passes over a road daily. This means that a road carrying 100 vehicles per day will experience the loss of 100 tons of aggregate per mile each year. Keeping rock fines in the road helps to keep larger aggregate in place and prevents corrugations or "washboarding".~~

~~Dust control is usually accomplished by adding calcium chloride to the road surface. The calcium chloride attracts moisture and keeps the road surface damp, which tends to keep dust particles from becoming airborne. Dust control efforts may be reduced or eliminated when funding levels decrease. Dust in some quantity must be expected on gravel surfaced roads, even when aggressive dust control methods are in use.~~

~~**B. Special Maintenance**~~

~~The following activities are performed as needed. Maintenance cycle or service life is generally several years for these items.~~

~~**Special Maintenance Summary**~~

~~Repair type~~	~~Typical Frequency~~
~~Minor Reconstruction~~	~~2 year cycle~~
~~Tree Trimming~~	~~5 – 8 year cycle~~

~~Detailed description of special maintenance activities:~~

~~• Minor Reconstruction: the road is reformed, similar to regular grading, but additional aggregate is added in significant quantities at this time if not enough was recovered from the sides and ditches. The additional aggregate will be quarry stone that meets current County standards and specifications for use on gravel roads.~~

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~~Changes to the shape of the crown may be made during this process to address drainage issues. A center crown may be replaced with a super elevation, in which one side of the road is higher than the other and the entire road surface slopes to one side.~~

~~Since the road is completely re-graded from shoulder to shoulder it may look as if it was widened, but this appearance is usually caused by the removal of vegetation that has colonized the road shoulder area.~~

- ~~Tree Trimming: trees, tree limbs, and foliage that presents a potential hazard to road users must be trimmed back to maintain a clear travel way and adequate sight lines. This work is typically performed in the Fall, Winter, and early Spring when trees are dormant. This work is more involved that roadside mowing and involves removal of limbs and whole trees where necessary.~~

~~Trees that have been damaged by vehicle impacts, storms, insects, decay, stream erosion, etc. and are in danger of falling into or otherwise blocking the roadway may be removed at any time.~~

~~**C. Emergency Maintenance:**~~

~~The following maintenance activities may be necessary to reestablish road serviceability after a storm event or other unforeseen emergency. Emergencies may include severe storms (microburst, tornado, etc.), hurricanes, sinkholes, flood waters, severe vehicular crashes, landslides, etc.~~

- ~~Removal of downed trees/flood debris~~
- ~~Application of additional aggregate~~
- ~~Grading, compaction, erosion control, etc.~~
- ~~Repair or replacement of damaged guardrail~~
- ~~Other repairs as needed~~

~~**D. "Spot" Maintenance:**~~

~~Special maintenance to address resident complaints or staff identified issues. Response based on conditions, stipulations of the Rural Roads Program, and available funding/resources.~~

~~**Protocol**~~

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~~1. Problem identified by staff or brought to Department's attention by resident~~
~~2. Problem logged into "on-line work request system"~~
~~3. Staff investigate conditions in field and develop solution(s)~~
~~4. Proposed work is scheduled and/or prioritized based on severity and extent of problem~~
~~5. Specific work is performed as soon as possible if problem is urgent, extensive, or severe; or problem is addressed during next round of regular maintenance if problem is less extensive or severe.~~

~~Urgency based on problem's potential as a safety hazard to road users or its ability to lead to additional road degradation if left unaddressed.~~

~~**E. Special Notes**~~

~~• Traffic Control Devices on Gravel Roads: Traffic control devices, specifically regulatory and warning signs, will be used on gravel roads where appropriate according to the standards established by the Maryland Manual on Uniform Traffic Control Devices (MD MUTCD). Sign size and frequency of use may be reduced to the minimums allowed by the MD MUTCD. Regulatory speed limit signs will not be posted at speeds lower than 25 miles per hour, and will be posted only where necessary. Signs that are not necessary for traffic control or safety will not be used so that the rural and scenic nature of the road is preserved.~~

~~• Road Width and Widening: Gravel road maintenance efforts will not extend outside the existing road limits and/or right of way, whichever is wider at any given location. Annual and special maintenance will not extend outside the existing road limits, but emergency maintenance and spot improvements may require additional right of way or landowner consent to conduct work on private property.~~

~~Attachments~~
~~• Attachment 1: Resolution No. 02-23 Rural Roads Program~~

~~Reference Materials and Locations~~
~~• Reference 1: *Gravel Roads Maintenance and Design Manual.* South Dakota Local Transportation Assistance Program (SD LTAP), November 2000.~~
~~• Reference 2: *The Pennsylvania Dirt and Gravel Road Maintenance Program, Annual Conference and Workshop, June 6-8, 2005.* Pennsylvania State Conservation Commission/Center for Dirt and Gravel Roads Studies.~~
~~• Reference 3: *Field Guide for Unpaved Rural Roads.* Wyoming Technology Transfer (T2) Center, March 1997.~~

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- ~~Reference 4. *Maryland Manual on Uniform Traffic Control Devices*. Federal Highway Administration, 2006, with modifications by the Maryland State Highway Administration, July 2009.~~